



## The progress of uMUSER Correlator

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Mingantu Spectral Radioheliograph heliograph (MUSER) is a dedicated solar radio synthetic aperture array, located on Mingantu Observing Station (MOS) in Inner-Mongolia of China, which is composed of two sub-arrays: MUSER-I and MUSER-H. The whole array includes 100 antennas lined along three spiral arms: 40 4.5m dish antennas in MUSER-I (0.4 ~ 2 GHz), and 60 2.5m dish in MUSER-H (2 ~ 15 GHz). The max antenna-pair baseline is around 3km.

The existing MUSER-I correlator has been working quite well for a long time since 2010 at MOS. Although the daily solar radio observing is carried out almost all time and plenty of data and images have been acquired in the past several years, the correlator's performance, especially MUSER-I correlator, is degrading due to long-period running and harsh lab environment, along with the new demands of new antennas adding into MUSER array. Therefore a more flexible, reconfigurable and extendable correlator is on the top of the list. Thanks to lower cost and better performance digital computing components (FPGA & SOC), the idea of acquiring both imaging spectroscopy and power spectrum with finer frequency resolution seems pragmatic. As a result RFI can be effectively excised over according frequency bins. Moreover, the planned 4-bit correlation will help to improve correlation efficiency [2] compared with 2-bit correlation.

To verify the new correlator system, one eight-channel prototype is proposed and in developing stage. The prototype of uMUSER correlator are implemented with SNAP2. This project is under the collaboration with Institute of Automation Chinese Academy of Sciences.

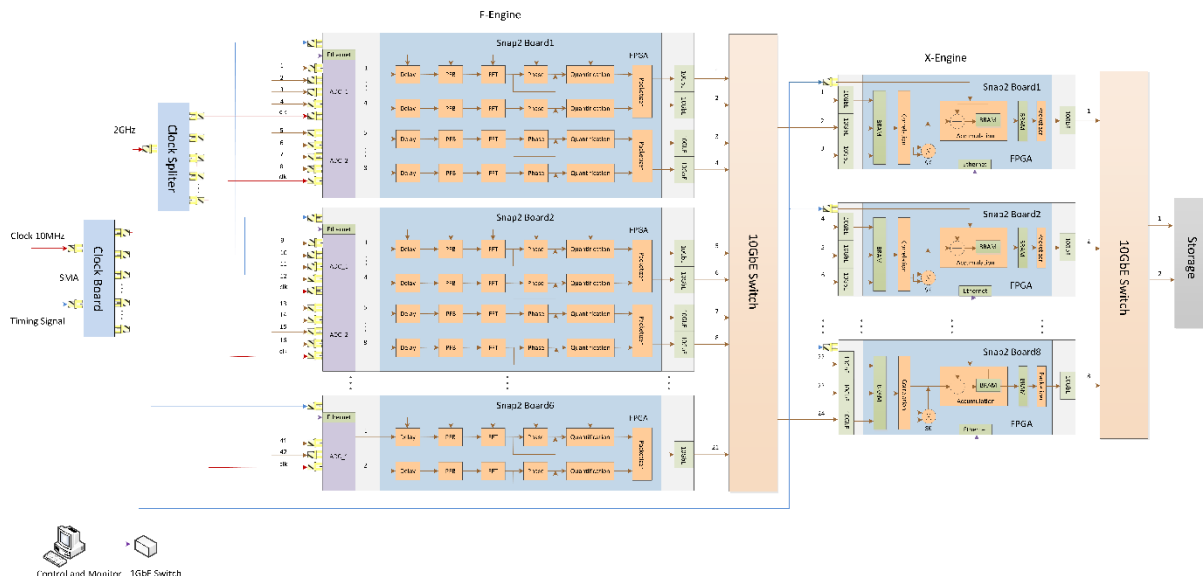


Figure 1. MUSER upgrade correlator hardware system

1. Yihua Yan, Wei Wang, Fei Liu, Lihong Geng, Zhijun Chen, Jian Zhang, "Radio imaging-spectroscopy observations of the Sun in decimetric and centimetric wavelengths," *Solar and Astrophysical Dynamics and Magnetic Activity, Proceedings of the International Astronomical Union, IAU Symposium*, Volume 294, 2012, pp. 489-494, doi:10.1017/S1743921313003001
2. A. Richard Thompson, James M. Moran, George W. Swenson Jr., *Interferometry and Synthesis in Radio Astronomy*, 3ed, 2017